

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
20 January 2005 (20.01.2005)

PCT

(10) International Publication Number
WO 2005/006580 A1

(51) International Patent Classification⁷: **H04B 1/26**

(21) International Application Number:
PCT/IB2004/051096

(22) International Filing Date: 1 July 2004 (01.07.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
03102094.4 10 July 2003 (10.07.2003) EP

(71) Applicant (*for all designated States except US*): **KONINKLIJKE PHILIPS ELECTRONICS N.V. [NL/NL]; Groenewoudseweg 1, NL-5621 BA Eindhoven (NL).**

(72) Inventors; and

(75) Inventors/Applicants (*for US only*): **WETZKER, Gunnar [DE/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL). LEENAERTS, Dominicus, M., W. [NL/NL]; c/o Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).**

(74) Agent: **ELEVLED, Koop, J.; Prof. Holstlaan 6, NL-5656 AA Eindhoven (NL).**

(81) Designated States (*unless otherwise indicated, for every kind of national protection available*): AE, AG, AL, AM,

AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

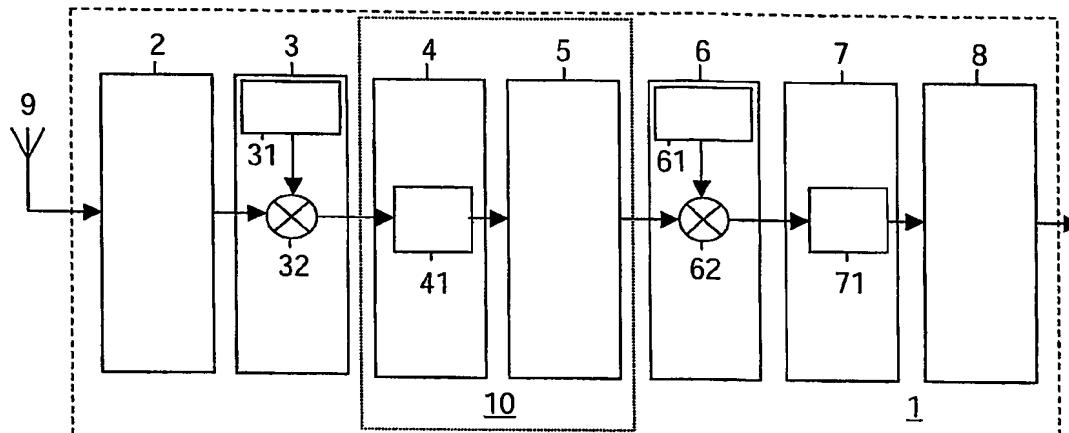
(84) Designated States (*unless otherwise indicated, for every kind of regional protection available*): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

Declaration under Rule 4.17:

— *as to applicant's entitlement to apply for and be granted a patent (Rule 4.17(ii)) for the following designations AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM,*

[Continued on next page]

(54) Title: RECEIVER FOR RECEIVING FREQUENCY SIGNALS USING DELTA-SIGMA MODULATORS



WO 2005/006580 A1

(57) Abstract: Receivers (1,11) for receiving radio frequency signals are provided with modulating stages (4,14) between mixing stages (3,13) and filtering stages (5,15) for deltasigma modulating intermediate frequency signals, to shape the quantisation noise out of the frequency band in which the wanted channel is located. Modulating stages (4,14) comprise delta-sigma modulators (41,42,43,90) with low-pass filters (91), quantisers (92) and digitalto-analog converters (93) having a low resolution and therefore a low power consumption. Due to delta-sigma modulating being done through a feedback loop, the receivers (1,11) have become less critical. The low-pass filters (91) comprise time-continuous filters, to avoid antialiasing filtering. The receivers further comprise digital further mixing stages (6,16) coupled to the filtering stages (5,15) for generating baseband signals and digital further filtering stages (7,17) coupled to the further mixing stages (6,16) for channel selective filtering the baseband signals.



PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ,
TM, TN, TR, TT, TZ, UA, UG, UZ, VC, VN, YU, ZA, ZM,
ZW, ARIPO patent (BW, GH, GM, KE, LS, MW, MZ, NA,
SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ,
BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE,
BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE,
IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI patent
(BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE,
SN, TD, TG)

Published:

— with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.